GONIOCLADIA AND *DYSCRITELLA* FROM THE PERMIAN OF QUEENSLAND

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(Plates xv-xvii)

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Synopsis

In the Queensland Permian, the polyzoan genera *Goniocladia* and *Dyscritella* are represented by the species *Goniocladia immensa* sp. nov. and *Dyscritella corella* sp. nov. This is the first record of both genera from this area and the first record of *Goniocladia* from the Permian of Eastern Australia. Both have their closest affinities with species occurring in the Western Australian Permian.

Introduction

Recent collections by the writer from the limestone of the Buffel Formation, south of Cracow, Queensland, revealed numerous fragments of a cyclostomatous polyzoan. One specimen exhibited a definite fenestrate habit with an undulating obverse surface. The weathered nature of this surface and the habit of the colony prevented all pertinent morphological features being recorded but those obtained are considered adequate to enable the species to be assigned to *Goniocladia*. *Fistulipora* sp. has been described by Wass (in press) from a similar locality and horizon but because of insufficient information on this species it is not possible to state whether it and *Goniocladia immensa* are conspecific.

Runnegar (1963) mapped an area of Permian sediments in the Maryborough Basin, north-west of Gympie, Queensland. The rich Permian fauna contained some Polyzoa, amongst them being a fine, ramose species which has been assigned to *Dyscritella*. This is the first definite record of this genus from the Queensland Permian. Hill (1957) lists *Dyscritella* sp. in a faunal list from the Dilly Beds near Springsure in the Bowen Basin but it is unaccompanied by descriptions or figures.

Abbreviations of repositories used throughout the text are :

U.Q. University of Queensland, Dept. of Geology Collection, Brisbane.

S.U. University of Sydney, Dept. of Geology Collection, Sydney.

U.W.A. University of Western Australia, Dept. of Geology Collection, Perth.

C.P.C. Commonwealth Palaeontological Collection, Bureau of Mineral Resources, Canberra.

Systematic Descriptions

Order Cyclostomata Busk, 1852

Family Goniocladiidae Nikiforova, 1938

Genus *Goniocladia* Etheridge, 1876

Carinella Etheridge, 1873, p. 433.

Goniocladia Etheridge, 1876, p. 522.

Goniocladia Etheridge ; Bassler, 1929, p. 88.

Goniocladia Etheridge ; Shulga-Nesterenko, 1933, p. 5.

Type Species.—(By monotypy) *Carinella cellulifera* Etheridge, 1873, p. 433, pl. 15, figs 1-3, from the Carboniferous Limestone Series of Scotland.

Diagnosis.—Zoarium reticulate with bifoliate branches bifurcating pinnately or irregularly and sometimes anastomozing, forming polygonal fenestrules; zooecia, separated by vesicular and dense tissue on both sides of median lamina, are tubular, without hemisepta and rarely developed diaphragms; zooecial apertures arranged in rows opening on obverse surface, sometimes with lunaria or peristomes of varying outline; median lamina with fine tubuli, expressed externally as a carina bordered by non-celluliferous tissue on both obverse and reverse surfaces.

GONIOCLADIA IMMENSA, sp. nov.

(Pl. xv, Figs 1-4; Pl. xvi, Figs 1, 2, 4)

Holotype.—S.U. 16413 from the Buffel Formation, at 32108453 Mundubbera 1 : 253,440 military map, three-quarters of a mile, north-west of "Cracow", six miles south of Cracow, Queensland.

Paratypes.—S.U. 16414-16416 from the above locality.

Diagnosis.—Coarse *Goniocladia*: branches wide and angular; fenestrules large, polygonal or elongate hexagonal; zooecial apertures in numerous rows on obverse surface; zooecia tubular, sometimes with diaphragms.

Description.—The zoarium is fenestrate with one incomplete specimen measuring 30 mm. square. Fenestrules are polygonal, 7·10 mm. to 13·90 mm. long and from 4·20 mm. to 5·70 mm. wide. Branch width varies from 2·90 mm. to 4·50 mm. Bifurcation occurs in a plane normal to the median lamina. Because of preservation the number of rows of zooecial apertures cannot be determined exactly but it is greater than four. Apertures are approximately 0·24 mm. in diameter, are surrounded by peristomes and possess small, inconspicuous lunaria in some places. Zooecial tubes are long and tubular; for a short distance they parallel the median lamina then diverge gradually to meet the periphery obliquely. They are crossed by sparse diaphragms separated by 0·60 mm. but in one exceptional case, three diaphragms are found in a space of 0·40 mm. Diaphragms are either straight or concave inwards. In all sections dense tissue is common adjacent to the median lamina and is replaced by vesicular tissue in the peripheral region. The vesicular tissue is coarse and occupies the greater portion of the interspaces.

An interesting feature is the pattern traced by the median lamina. In one area, repeated bifurcation enables the lamina to follow a polygonal pattern which results in it abutting against the periphery of an older branch.

Discussion.—*Goniocladia immensa* is a much larger species than *G. laxa* (de Koninck), 1877 and *G. parva* Crockford, 1947 from the Lower Carboniferous of New South Wales. These two species are also devoid of diaphragms. *Goniocladia americana* Girty, 1909, from the Guadalupian of U.S.A. has branches of similar width but possesses smaller fenestrules. None of the species described by Shulga-Nesterenko (1933) are comparable with the Queensland species; *G. cyclopora* var. *magnafenestrata* Shulga-Nesterenko, 1941, from the Lower Permian of the Pechora region seems to be the only Russian species to approach *G. immensa*. It has fenestrules of similar length but is smaller in other measurements. *G. timorensis* Bassler, 1929, from the Basleo Beds of Timor is a smaller species. C.P.C. 1111A assigned to this species by Crockford (1957) shows the reverse surface. Branches are of similar width but fenestrules are smaller than in *G. immensa*. *Goniocladia indica* Waagen and Pichl, 1887, described originally from the Salt Range is poorly known, but comparison of the Cracow material with that assigned to *indica* by Crockford (1957) from the Fitzroy Basin, Western Australia, reveals that the two species are most similar. Specimen 22336C, U.W.A. of *G. indica* has a branch width of 1·75 mm. and a fenestrule length and width of 7·90 mm. and 5·00 mm. respectively (Pl. xvi, Fig. 3). C.P.C. 1078B (Pl. xvi, Fig. 5) has comparable measurements together with three, and sometimes

four rows of zooecial apertures. Only the type locality in the Buffel Formation which can be correlated with Fauna II of Dickins (in Dickins *et al.*, 1964) has yielded specimens of *Goniocladia immensa*. Additional specimens catalogued are S.U. 16417-16424.

Order TREPOSTOMATA Ulrich, 1882

Family STENOPORIDAE Waagen and Wentzel, 1886 rev. and emend. Duncan, 1949

Genus *Dyscritella* Girty, 1911

Dyscritella Girty, 1911, p. 194.

Dyscritella Girty ; Lee, 1912, p. 151.

Dyscritella Girty ; Bassler, 1941, p. 178.

Dyscritella Girty ; Crockford, 1943, p. 259.

Type Species.—(By original designation) *Dyscritella robusta* Girty, 1911, p. 193 from the Fayetteville Shale of Arkansas, U.S.A. (Bassler, 1941, p. 178, figs 18-20).

Diagnosis.—Zoarium ramose or encrusting ; zooecia tubular, without diaphragms, thin walled in axial region, evenly thickened in peripheral region ; apertures oval or rounded ; mesopores and acanthopores present, the latter usually of two sizes.

DYSCRITELLA CORELLA, sp. nov.

(Pl. XVII, Figs 1-7)

Holotype.—U.Q. 52939 from the middle part of the " upper limestone, Middle Gympie Formation ", at 752544 Gympie 1 : 63,360 military map, about one mile west of Mount Corella and 6·5 miles north-west of Gympie, Queensland.

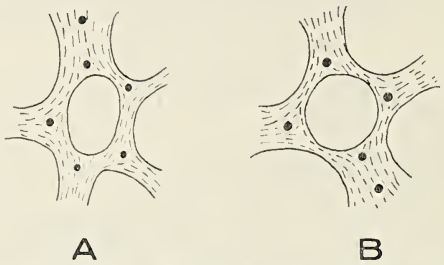
Paratypes.—U.Q. 52940, 52941, 52945, 52948 from the above locality.

Diagnosis.—Fine, ramose species of *Dyscritella* with a few, small acanthopores which increase in number near the occasional mesopore.

Description.—Zoaria are ramose with a diameter of 1·30 mm. to 1·90 mm. Zoarial diameter increases from 1·44 mm. to 1·80 mm. proximal to widely spaced bifurcations. These occur immediately distal to a growing tip and brauches produced are mutually perpendicular. Measurement of their diameter cannot be effected because of poor preservation. Zooecial apertures are oval and arranged in irregular diagonal and longitudinal rows. They are 0·26 mm. to 0·32 mm. long and 0·12 mm. to 0·16 mm. wide. Centres of successive apertures in a longitudinal row are separated by 0·50 mm. to 0·80 mm. Mesopores, 0·12 mm. in diameter, are developed occasionally. They are associated with more acanthopores than the usual three or four surrounding an aperture. Acanthopores which are placed adjacent to, or at the proximal end of the zooecia develop in the axial region. Zooecial walls are thin in the axial region and diverge gradually at 25° to 30° from the growth direction. In the peripheral region they thicken rapidly and meet the periphery at 65° to 80°. Walls of the peripheral region are thickened evenly except if a growing tip is present. In this region an annulation is evident at the junction with the axial region. Growing tips have been observed 10 mm. apart. The peripheral region occupies from one-quarter to more than one-third of the zoarial diameter. In zoaria of diameter, 1·70 mm. and 1·90 mm., the width of the peripheral region is 0·65 mm. and 0·45 mm. respectively.

Discussion.—This new species can be distinguished from the other two species described from Eastern Australia, *Dyscritella restis* Crockford, 1943 (text fig. 2A, the larger of the diagrams labelled 3A) and *D. porosa* Crockford, 1943 by its almost complete absence of mesopores and the small acanthopores of one size. *D. tenuirama* Crockford, 1957 exhibits a diagonal rather than a longitudinal

orientation of the zooecial apertures. This, together with the presence of more mesopores results in the acanthopore arrangement being more irregular than in *D. corella* (see Text Figure 1). Bending of zooecial tubes into the peripheral region is more gradual and the thickening of zooecial walls is less abrupt in *D. tenuirama*. Linear measurements of the two species are very similar.



Text-fig. 1. *Dyscritella tenuirama* Crockford, 1957, from the Noonkanbah Formation, Western Australia. C.P.C. 1161, drawing to show relation of acanthopores to zooecial apertures. (Not to scale).

Dyscritella corella was originally thought to belong to *Rhombopora* Meek, especially as in longitudinal section it showed the absence of hemisepta, diaphragms and a true vestibulum with an abrupt thickening of the walls in the peripheral region. These features are characteristic of " topotype " material of *Rhombopora lepidodendroides* Meek in the S.U. Collection but the most objective characters of this species are the form, nature and abundance of the acanthopores and the longitudinal and diagonal orientation of the zooecial apertures. Material studied is from the same horizon as *R. lepidodendroides* and as close as possible to the original locality. Features considered here can be observed also on " topotype " material in the United States National Museum.

The irregular orientation of zooecial apertures and nature of the acanthopores with the development of the occasional mesopore satisfy me that the species is best assigned to *Dyscritella*.

Dyscritella corella has been found only at the type locality. This stratigraphic horizon can be correlated probably with Fauna IV of Dickins (in Dickins *et al.*, 1964). Additional specimens catalogued are U.Q. 52942-44, 52946-47, 52949-51.

In addition to the above species, two specimens referable to *Saffordotaxis* sp. and ? *Ptylopora* sp. are catalogued as U.Q. 52952 and 52953 respectively from the locality of *D. corella*. 52952 is a transverse section which shows the zooecial tubes arising from a central point (Pl. xvii, Fig. 8). The specimen referred to ? *Ptylopora* sp. is a weathered surface with a main branch from which arise two secondary branches. The secondary branches are joined by a dissepiment (Pl. xvii, Fig. 9).

Conclusions

As palaeontological studies of Eastern Australian Permian faunas progress, many genera new to this area but common in the Permian of Western Australia emerge. Wass (in press) has recorded many polyzoan genera and species from the Bowen Basin which are common in the Permian of Western Australia. Their distribution and implications are being studied. Whereas some phyla also exhibit notable differences from the Western Australian faunas, studies of Polyzoa have shown the Eastern and Western Australian Permian faunas to be markedly similar. The occurrence of *Goniocladia* in the Eastern Australian Permian and the presence of *Dyscritella corella*, so similar to *D. tenuirama*, are considered to be of palaeogeographic significance. Further studies of Eastern

Australian polyzoans and of Western Australian Permian Polyzoa from the Lower Permian of the Canning Basin, and the Carnarvon and Perth Basins may continue to exhibit this similarity.

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EXPLANATION OF PLATES XV–XVII

PLATE XV

Fig. 1. *Goniocladia immensa*, sp. nov.; S.U. 16413, before sectioning. X5.

Fig. 2. *Goniocladia immensa*, sp. nov.; S.U. 16413, after sectioning. X3.

Fig. 3. *Goniocladia immensa*, sp. nov.; S.U. 16416, showing median lamina and diaphragms across zooecial tubes. X10.

Fig. 4. *Goniocladia immensa*, sp. nov.; S.U. 16415, showing relation of zooecia to median lamina and closely spaced diaphragms across zooecia. X10.

PLATE XVI

Fig. 1. *Goniocladia immensa*, sp. nov.; S.U. 16413, showing shape of zooecial tubes in transverse section and diaphragms across tubes. X10.

Fig. 2. *Goniocladia immensa*, sp. nov.; S.U. 16414, showing bifurcation of median lamina, relation between dense and vesicular tissue and diaphragms across zooecial tubes. X10.

Fig. 3. *Goniocladia indica* Waagen and Pichl ; U.W.A. 22336C from the Noonkanbah Formation, Western Austral X4 approximately.

Fig. 4. *Goniocladia immensa*, sp. nov.; S.U. 16413, showing median lamina of branch abutting against lateral portion of an older branch (polished section). X10.

Fig. 5. *Goniocladia indica* Waagen and Pichl ; C.P.C. 1078B from the Noonkanbah Formation, Western Australia. X3.

PLATE XVII

Fig. 1. *Dyscritella corella*, sp. nov.; U.Q. 52939, longitudinal section with annulations developed at the base. Cross structures in zooecial tubes result from structure of calcite. X10.

Fig. 2. *Dyscritella corella*, sp. nov.: U.Q. 52939, tangential section showing relation of zooecial apertures and acanthopores. X20.

Fig. 3. *Dyscritella corella*, sp. nov.; U.Q. 52945, longitudinal section showing branching developed distal to growing tip. X10.

Fig. 4. *Dyscritella corella*, sp. nov.; U.Q. 52939, transverse section. X20.

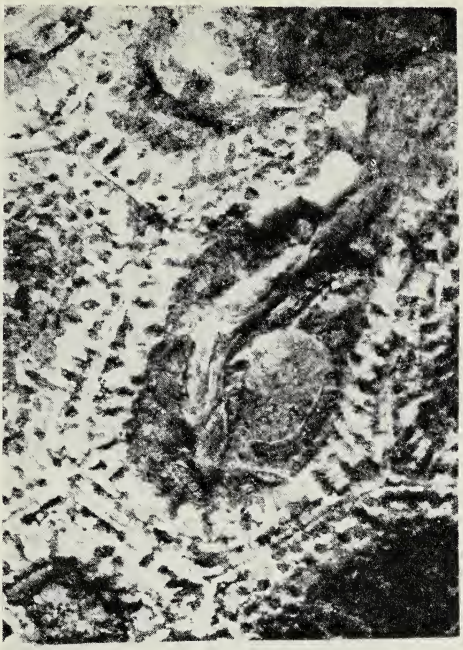
Fig. 5. *Dyscritella corella*, sp. nov.; U.Q. 52940, longitudinal section showing zooecia oblique to the periphery. X10.

Fig. 6. *Dyscritella corella*, sp. nov.; U.Q. 52944, longitudinal section. X10.

Fig. 7. *Dyscritella corella*, sp. nov.; U.Q. 52946, oblique longitudinal section. X10.

Fig. 8. *Saffordotaxis*, sp.; U.Q. 52952, transverse section. X20.

Fig. 9. ? *Ptylopora*, sp.; U.Q. 52953. X5.



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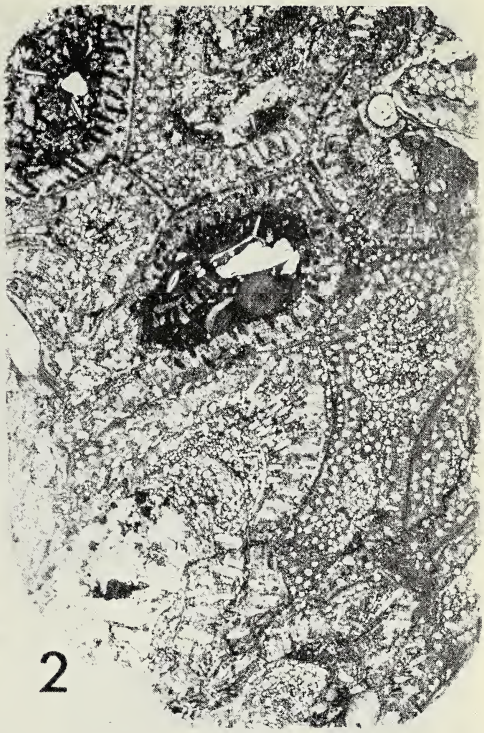

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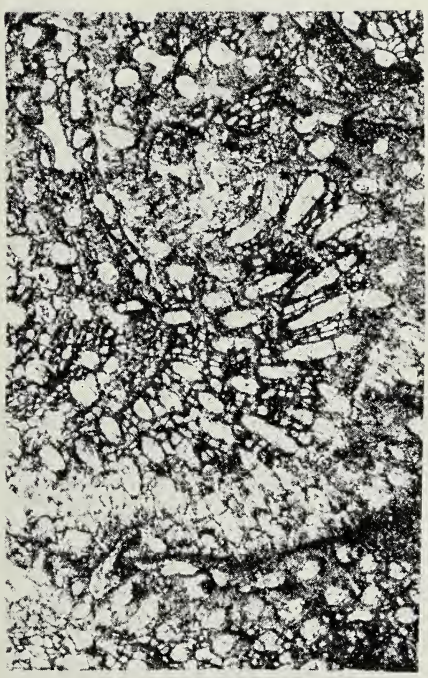

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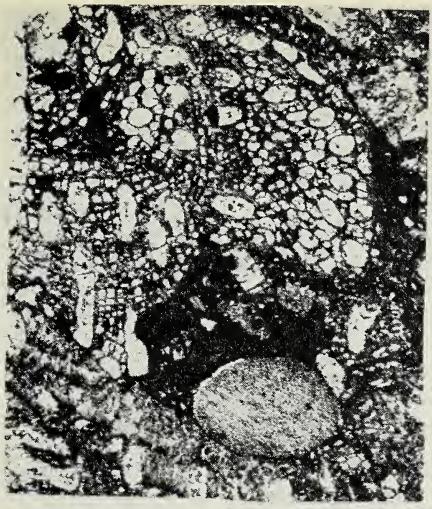
Goniocladia immensa.



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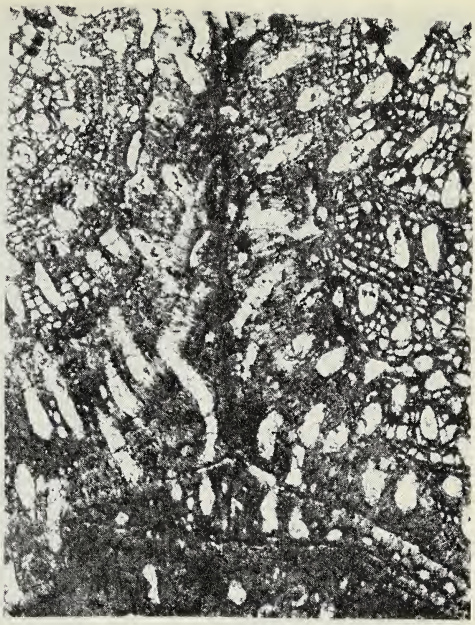

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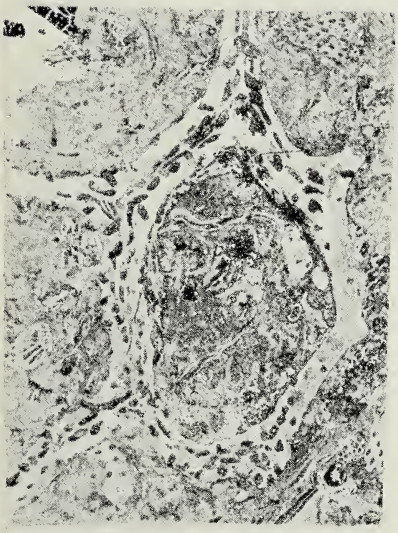

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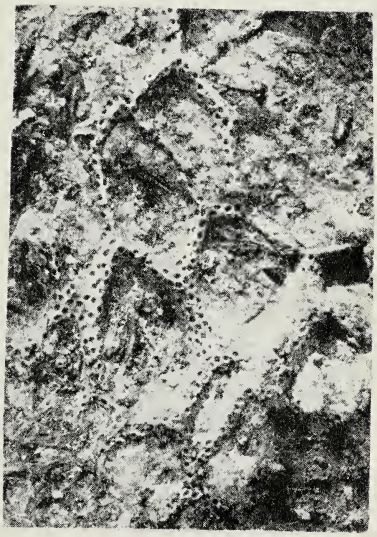

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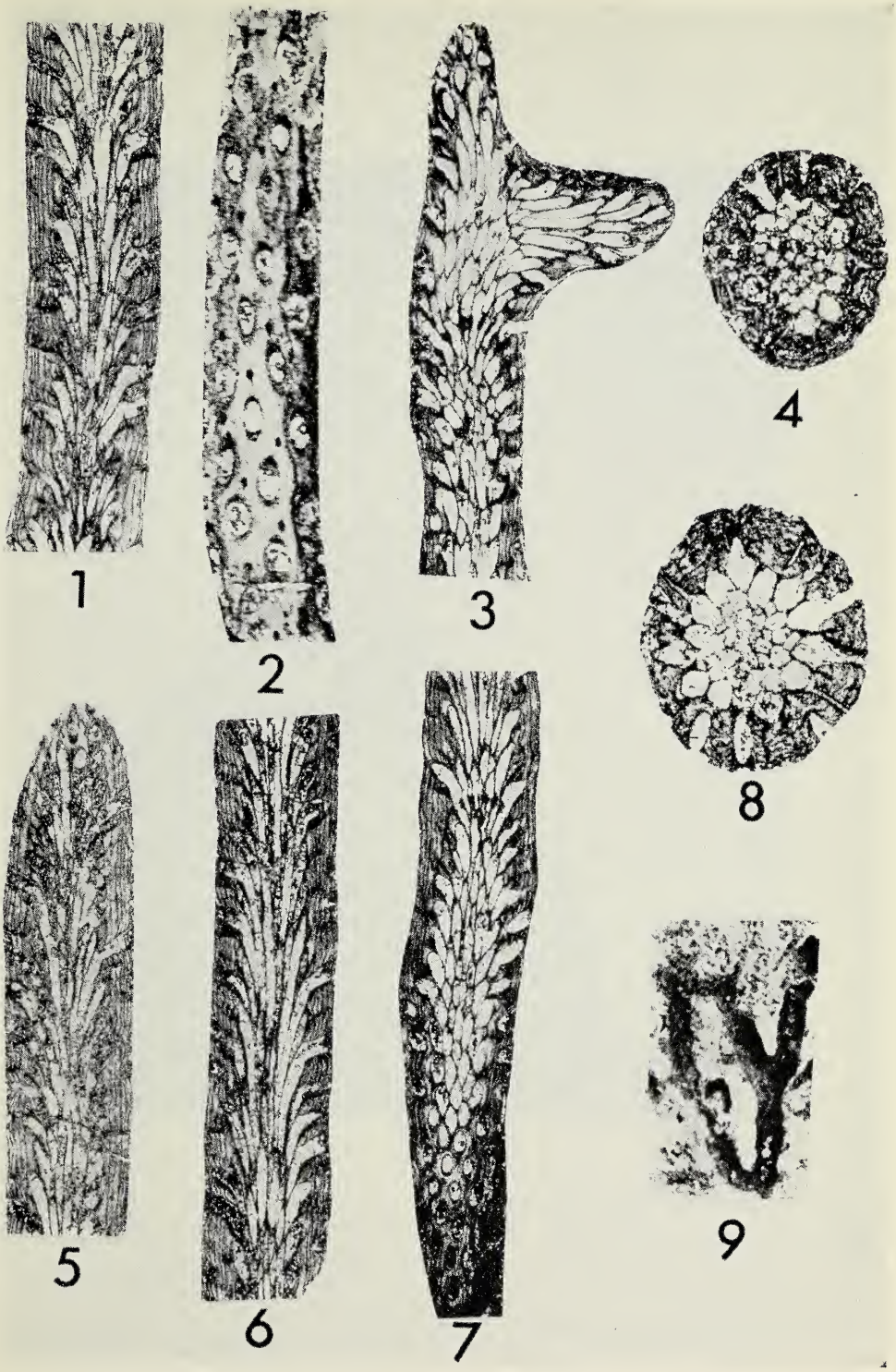
Goniocladia immensa and *Goniocladia indica*.



Dyscritella corella, *Saffordotaxis* sp and ? *Ptylopora* sp.